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SPATIO-TEMPORAL VARIATIONS IN EMPLOYMENT GROWTH RATES OF DUTCH FIRMS

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ABSTRACT

The upswing of the Dutch economy after the deep recession at the beginning of the eighties is reflected in a formidable growth of employment during the period 1985-92. This paper describes and explains the spatio-temporal variations in the employment growth of individual firms in the Netherlands for the above period. A set of regional micro data on actual realizations of the number of people employed (based on annual surveys of Chambers of Commerce) is used to identify the type of firms in urban and suburban areas which appeared to expand most significantly their workforce.

The analytical framework of this paper will be based on the ''Urban Field'' theory which suggests that economic growth rates in suburban areas may be higher than in urban centres due to the presence of ''physical communication'' advantages in the non-central areas. This hypothesis will be tested by comparing annual employment growth rates in urban and suburban areas in the Netherlands.

As regards the spatio-temporal variations in economic growth across sectors, it is stressed in recent theories on spatial diffusion of innovations that technological change can be conceived of as a ''creative diffusion'' process. In this framework, it is hypothesized that non-central regions may become dominant concerning innovative activities, that are related to later phases of the life cycle of new technologies of firms. This paper explores the validity of this ''creative diffusion'' hypothesis for the Netherlands by comparing employment growth rates of more innovative and less innovative firms in central and non-central regions. Various sectoral classifications and typologies are applied in our analysis in order to measure the firm's degree of innovativeness.

After an exploratory statistical analysis of the behaviour of firms an explanatory approach will be adopted. In this, a labour demand model based on

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the adjustment of the level of employment to exogenous shocks in production (output) is estimated.

The exploratory analysis shows that the differences in employment growth according to firm size and sector are considerable. In particular, innovative firms in suburban areas appear to realize the highest growth in employment.

The explanatory model for labour demand reveals that the growth of sales in a certain year has a significant influence on the level of employment. Surprisingly, employers anticipate only to a limited extent expected changes in sales of a subsequent year. It is also remarkable that even the dynamic group of small, information-oriented firms exhibits this risk-avert behaviour.

The paper is concluded with some policy implications.

I. INTRODUCTION

The current recession seems to mark the end of a period of unprecedented growth of employment in The Netherlands during the period 1985-1992 (the "seven years of prosperity"). The recent rapidly rising unemployment—and the increased use of social benefits induced by this rise—indicates that a growth in the number of jobs will be of the utmost importance in the next years. At present, no solution has been found to the problem of the increasing shortage of jobs, so that a thorough analysis of the unemployment issue and the functioning of the labour market is desirable.

In a recent study on The Netherlands, Den Butter and Broersma (1993) used a so-called flow approach to the labour-market in order to study the process of job creation and job destruction. Their macro analysis shows that job creation is mainly boosted by favourable expectations of the growth of sales and by the promotion of entrepreneurship. Besides, they claim that "technological development is a necessary condition for job-creation".

A more detailed interpretation of these aggregate results leads to the intriguing question *which type* of firm *on which location* is successful in job creation as a result of changes in sales expectations and production environment. In this paper an attempt will be made to answer this question, by explaining regional and sectoral differences in the demand for labour as a result of differences in actual sales and expected variations of sales in the next year for individual firms. In this analysis data on the annual development of employment and sales have been used, originating from the so-called ERBO-questionnaire of the Dutch Chambers of Commerce.[1] Consequently, the regional and sectoral

[1]Ideally, job creation and job destruction should be treated separately in a regional-sectoral analysis. Unfortunately, the available data do not allow such a refined distinction.

diversity of the labour market will be the main focus of this study. We will first briefly consider the theoretical background of our approach and its implications for the expected employment growth in individual firms.

Enterpreneurship and dynamics of firms in a spatial setting has recently been studied intensively by various authors (e.g. Boschma, 1994, Van Geenhuizen, 1993, Kleinknecht, 1987, and Suarez-Villa, 1989).

According to Tordoir (1993), regional economic dynamics tends to play an increasingly important role at the *micro* and *meso* level in The Netherlands, while at higher geographical level the differences tend to decrease. The traditional difference between the large urbanized areas with major cities in The Netherlands (the so-called ''Randstad'') and the periphery is gradually fading away. On the other hand, the (intermediate) suburban areas have become increasingly important for economic development in the past decade (see, for example, Lambooy and Manshanden, 1992). It appears that also outside the urban areas favourable conditions for production occur that constitute incubation areas for new economic activity. According to Lambooy and Manshanden (1992), this spatial development is the result of the increasing importance of *accessibility*, which—according to the ''Urban Field'' theory—may be considered as an economy of agglomeration (as a result of the reduced costs of fysical communication; see also Bruinsma, 1994). This leads us to the first hypothesis of this paper:

I.1 *Firms in suburban areas experience a higher growth of employment than firms in urban areas*

An extremely important characteristic within the framework of the sectoral typology of Dutch firms is the degree of innovativeness. In a recent study Kleinknecht and Brouwer (1994) have found support for the existence of a positive relationship between the degree of innovativeness and employment[2]. According to these authors especially product-oriented Research and Development (R&D) has a positive impact on job creation. Therefore, the second hypothesis is:

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[2]This is in line with the recommendation ot Den Butter and Broersma (1993) to stimulate job creation by means of technological development.

I.2 *More innovative firms show a higher growth of employment than less innovative firms*

Finally, we will consider the regional and sectoral component jointly by means of a recently developed theory on the spatial diffusion of innovations (Davelaar, 1991). This so-called theory of ''creative diffusion'' predicts that suburban areas are important incubators of innovative activities in later stages of the ''technological paths of development'' (i.e., product or process innovations that follow the introduction of a new basic product). The position of dutch regions as regard to their indigenous innovation potential is, for example, illustrated in Davelaar and Nijkamp (1992) who found that ''a great many (urban) regions in the central parts of the Netherlands (the Randstad) appear to be in a rather unfavourable position regarding innovative capacity of small industrial firms, even for firms which on an average are assumed to have favourable technological prospects. Hence, it is concluded by these authors that ''the central part of the country is by no means more innovative than remaining, and sometimes peripheral parts (as least as far the innovative behaviour of small and medium size industrial firms is concerned)''. This results in the third and final hypothesis of this paper:

I.3 *Innovative firms in suburban areas generate more employment than innovative firms in urban areas, relative to firms in the other subsectors*

In this paper we will test the above-mentioned hypotheses by analyzing—at the level of the firm—the regional and/or sectoral differences in annual growth rates of employment during the period 1985-92. In this way it can be determined which firms on which location were most successful in creating employment. Next, a labour-demand model will be developed and applied in order to examine the underlying factors that are responsible for the observed differences. Special attention will be paid to the influence of the actual sales and the expected growth of sales. This paper will be concluded by a discussion of the policy implications of our findings.

II. DATA AND REGIONAL CLASSIFICATION

As was mentioned before, the date used in our analysis stem from the Dutch Questionnaire on the Regional Development of Firms (''Enquête Regionale BedrijfsOntwikkeling,'' abbreviated as ERBO). This is an annual survey among firms in the Netherlands, held each year from September to October by the Chambers of Commerce. This questionnaire is mailed to—and answered

by—almost all firms with fifty or more employees. From all small firms having less than fifty employees a sample of about 70 per cent is taken. Firms without employees are not addressed. This questionnaire is held by each Chamber of Commerce all over the country. In our study we have used the result for the Chamber of Commerce districts of Amsterdam, Utrecht, Den Bosch and Zaandam for the years from 1985 to 1992[3]. The geographical location of these Chambers allows the above-mentioned areas to be tested on urban/suburban differences.

In the ''urban field'' and ''creative diffusion'' theories a classification is made amongst others between *urban*- or *central*-regions and *suburban* regions. In order to analyse the differences in the growth of employment between these two types of regions in The Netherlands, the complete data from the four above-mentioned Chambers of Commerce have been used. Amsterdam is a typical example of an urban region. Den Bosch, on the other hand, is—in the Dutch context—an intermediate suburban region outside of the Randstad, situated in the South-East expansion area of the Randstad. Utrecht is a suburban region as well, but it forms part of an urban system (viz., the northern wing of the Randstad). The fourth city in this study, Zaandam, forms to a certain extent part of the Amsterdam agglomeration. However, due to its situation north of the North-Sea Canel (which is real physical barrier), Zaandam does not have the fiscal communication advantages that characterise a suburban region like Den Bosch (see also Lambooy and Manshanden, 1992).

III. SECTORAL CLASSIFICATION

Since spatial and sectoral dynamics are intertwined phenomena (see, for example, Scott and Storper, 1987), we will consider now in more detail the *sectoral* classification. The second hypothesis in this study stated that more innovative firms tend to show a higher growth of employment than less innovative firms. However, it is difficult to determine unambiguously the degree of innovativeness. Besides, such a classification would go right across the current standard sectoral classifications, so that a classification according to the degree of innovativeness can be made at several levels, namely at both the macro level and within a specific sector.

For a classification at the macro level, Louter (1994) applies the criterion of the *orientation* of Dutch firms; a distinction is then be made between

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[3]For Den Bosch no data were available for the year 1985.

material-oriented, *person-oriented* and *information-oriented* firms. Material-oriented firms can be found, for example, in the sectors of agriculture, manufacturing, wholesale trade and transport. The category of person-oriented firms consists of firms in sectors like retail sale and catering industry. An example of an information-oriented sector can be found in the business services. In this third category of firms, many new branches have developed in the past decade. It can thus be expected that information-oriented firms have experienced a rapid growth of employment in the period 1985-92.

Within the category of information-oriented firms, *business services* have a prominent place. These business services can again be subdivided into more and less traditional industries. In our study, four categories of business services have been used, viz. *financial services*, *non-financial services*, *computer services* and *engineering advice services*. Financial services include accountancy offices and tax consultancy offices. Non-financial services are *inter alia* advertising agencies and economic consultants. Computer services refer to hardware and software activities. The fourth category comprises firms that specialize in engineering advice. All other firms (manufacturing, etc.) can be found in the fifth category (other firms). The category of financial services is an example of a traditional information-oriented sector. On the other hand, the branch of computer services is of a much more recent origin. Therefore, within the business services, this last category is expected to show the highest growth of employment.

Another sector that deserves further attention is the sector of *manufacturing*. For this sector a relatively slow growth of employment is expected. However, not all the subsectors of manufacturing seem to share this gloomy outlook. Considerable differences in the degree of technology-intensity exist between different subsectors. In the same way as Davelaar (1991), we make a distinction between *technology-intensive* and *technology-extensive manufacturing* firms. Examples of technology-intensive manufacturing are the electronical and optical industry. Technology-extensive firms can be further subdivided into *manufacturing*, *light manufacturing* and *raw materials/heavy industry*. It is plausible that technology-intensive firms will experience the fastest employment growth of all manufacturing subsectors. The fifth category (other firms) includes all non-manufacturing firms.

If we relate *the R&D expenditures* of a firm to its sales, a classification can be made into more and less innovative firms. The electronical and petrochemical industry are typical examples of *more innovative* industries. In these industries, the R&D share in the company's budget is generally high. *Less innovative* subsectors are, for example, the furniture and textile industry. The third category

(other firms) comprises all other firms.

A slightly different distinction in the manufacturing sector is between "*traditional*" (*old line*) firms and "*modern*" (*new line*) firms (see also Davelaar, 1991). The technology of firms that produce, for example, foods or textile can to some extent be characterized as traditional, whereas firms that produce machines or petrochemical products are more likely to apply relatively modern types of technology. Again, all other firms in the manufacturing sector are included in the third remaining category. Another distinction made in this study is between *small firms and large firms*. It is conceivable that small firms are more flexible in their decision-making, and thus show a different behaviour as far as job creation and job destruction is concerned. Within large firms, decision-making might take place in a more bureaucratic manner. In this study, a distinction is made between small firms (having less than fifty employees), and large firms (which have fifty or more employees).

In Table 1 an overall picture is given of the above-mentioned classifications of firms[4]. Besides, for each classification we have marked with a + sign the subsector having a relatively high expected growth rate of employment.

Table 1

Various Classifications of Firms According to Sector and Size

Category→ Classification↓	1	2	3	4	5
Technology intensity	technology intensive +	manufacturing	raw materials/ heavy industry	light manufacturing	other
Innovativeness	more innovative +	less innovative	other	—	—
Old line/new line	old line	new line +	other	—	—
Business services	financial serices	non-financial services	computer services +	engineering advice	other
Firm orientation	materials	persons	information +	other	—
Size of the firm	small +	large	—	—	—

[4]In order to save space, a more detailed specification of (sub)sectors at a SIC-level is not presented in this paper, but is available on request.

IV. EXPLORATORY ANALYSIS OF EMPLOYMENT GROWTH RATES 1985-92

In our analysis of employment growth in Dutch regions only employees who work at least fifteen hours a week have been taken into account. For each of the four Chambers of Commerce, and for each of the five sectoral classifications, the annual employment growth is calculated for the years from 1985 to 1992. For each case, a distinction is made between small firms and large firms. Tables 2 and 3 show the number of available observations for each region and for each category of firms (the numbers in these tables are here for the sake of brevity only given for the year 1992, but they are representative for the other years as well). The results of these descriptive statistics are presented in Tables 4, 5 and 6. We will now briefly discuss these results.

Table 2

Number of Firms in the Different Subsectors that Participated in the ERBO-Survey (1992)

	Small firms					Large firms				
	1	2	3	4	5	1	2	3	4	5
Technology intensity	508	481	11	144	7110	81	69	2	48	815
Innovativeness	529	595	7130			108	90	736		
Old line / new line	1045	1211	5998			144	178	612		
Business services	34	170	82	79	7889	2	28	33	25	846
Orientation of the firm	4452	2492	572	738		719	74	111	30	

Table 3

Number of Firms in the Different Chambers of Commerce that Participated in the ERBO-Survey (1992)

Region	Small firms	Large firms
16: Den Bosch	2842	244
30: Utrecht	2512	299
33: Amsterdam	2419	327
35: Zaandam	481	64

Table 4

Average Annual Growth of Full-time Employment during the Period 1985-92, for each Sectoral Classification

	Small firms					Large firms				
	1	2	3	4	5	1	2	3	4	5
Technology intensity	4,29	3,38	10,53	2,84	3,60	0,83	0,42	7,98	–0,10	2,06
Innovativeness	4,21	3,17	3,65			0,48	–0,67	2,81		
Old line / new line	2,99	4,05	3,66			–0,08	0,73	3,19		
Business services	5,90	8,01	12,28	6,95	3,44	5,49	3,59	8,83	4,63	1,71
Orientation of the firm	3,70	2,07	7,92	4,03		1,12	1,86	7,36	9,42	

Table 5

Average Annual Growth of Full-time Employment during the Period 1985-92, for each Chamber of Commerce

Region	Small firms	Large firms
16: Den Bosch	4.82	2.76
30: Utrecht	4.05	1.97
33: Amsterdam	2.46	1.76
35: Zaandam	3.33	0.63

Small and Large Firms

Small firms, having less than fifty employees, grow considerably faster than large firms (see Table 5). The average annual growth of employment in the period 1985-92 for small firms in the different Chambers of Commerce, varies between 2.46 and 4.82 per cent. For *large firms* the average annual growth of employment is between 0.63 and 2.76 per cent.

Table 6

Annual Growth of Full-time Employment, for each Chamber of Commerce

Small Firms

Region	1985	1986	1987	1988	1989	1990	1991	1992
16: Den Bosch		7.29	4.78	4.23	5.77	5.1	3.63	2.92
30: Utrecht	3.43	4.4	4.77	4.34	5.07	4.76	3.77	1.84
33: Amsterdam	2.62	3.18	3.06	2.24	2.6	2.17	2.69	1.09
35: Zaandam	5.71	1.37	2.41	4.1	3.81	4.27	3.63	1.37

Large Firms

Region	1985	1986	1987	1988	1989	1990	1991	1992
16: Den Bosch		4.13	2.99	3.94	3.18	3.28	1.86	−0.03
30: Utrecht	1.67	3.18	1.95	2.66	2.97	2.6	−0.51	1.23
33: Amsterdam	−0.09	1.94	0.38	1.57	4	4.56	2.13	−0.38
35: Zaandam	1.01	−0.79	−1.12	0.26	2.11	1.26	2.53	−0.23

Regional Differences

The differences in the growth of employment between firms in the four Chambers of Commerce are considerable, although less pronounced than the differences between the different types of firms (see Tables 4 and 5). Both small and large firms in the suburban region of *Den Bosch* appear to have a higher growth than firms in the other three cities.

During the period 1985-92, small firms performed poorest in Amsterdam, followed by Zaandam. As far as large firms are concerned, Zaandam experienced the lowest growth of employment. The average annual growth of employment in this Chamber of Commerce for firms having fifty of more employees, was only 0.63 per cent. Both small and large firms in Utrecht have an average employment growth which falls somewhere in between Den Bosch on the one hand and Amsterdam and Zaandam on the other.

As Table 6 shows, the relatively high growth figures for the regions analyzed in this study mainly occur during the period 1986-90. In each year, small firms have the best performance in Den Bosch and Utrecht. For the years 1986-88

and 1992, this is also the case for large firms; in the intermediate years large firms in Amsterdam attain the highest growth of employment. In the years 1991-92, it can be observed that in general the regional growth percentages decline, while in these years also the regional differences become somewhat less pronounced.

The general trend is thus *that employment in (small) firms in suburban regions grows faster than in the urban regions, which supports our first hypothesis*. However, it should be noticed that in this study only four (sub)urban regions have been taken into consideration, and that Den Bosch is likely not be representative for all suburban regions in The Netherlands.

Sectoral Differences

A category of firms with a high growth of employment is formed by the *information-oriented firms*. Small firms in this category grow approximately two times as fast as material-oriented firms and four times as fast as persons-oriented firms (see Table 4). The differences in performance between firms with a different orientation becomes even more distinct when large firms (fifty or more employees) are considered.

Business services is an example of a sector that is strongly information-oriented. Within this sector, the performance of the *computer services* is striking. With an average growth of employment of more than 10 per cent, these firms constitute the best performing subsector in the four Chambers of Commerce analyzed in our study. Indeed, all subsectors of the business services experienced an employment growth which was well above the average growth for all firms.

Manufacturing is a typical example of a material-oriented sector. The growth in this sector is relatively slow, in comparison with the growth in business services. Nevertheless, within the sector of manufacturing, there are significant differences in the growth of employment between the different subsectors. The growth percentage of the so-called *new-line firms* is about one per cent higher than that of old-line firms. The large firms in this last category have on average even lost employment during the period from 1985 to 1992.

The classification of manufacturing firms according to their degree of innovativeness coincides partly with the classification between old-line and new-line firms. Accordingly, *more innovative firms* show a higher growth of employment than less innovative firms. Large firms in the category "less innovative" show a considerable loss of employment during this period.

The third classification of manufacturing firms in this study is based on the

degree of technology intensity. The results for the category ''raw materials / heavy industry'' have little value, since type of firms are hardly found in the four areas concerned. Keeping in mind the results for the above-mentioned classifications of the manufacturing firms (namely, new line/old line and more innovative/less innovative), it is not surprising that *technology intensive firms* on average grow faster than other manufacturing firms. This is especially the case for firms with less than fifty employees. The firms in the subcategory ''manufacturing'' performed very poor. Large firms in this category lost even slightly employment.

The ''modern'' or ''innovative'' subsectors in the four areas thus appear—in line with our expectation—to perform better than the other subsectors. Especially employment growth in the information-oriented firms is striking. Although the growth of the employment in the sector manufacturing as a whole is rather slow, specific subsectors with a ''modern''/''technology intensive''/''innovative'' character can be distinguished, that show a considerable faster growth.

We may thus conclude that *our second hypothesis, which stated that more innovative firms grow faster than less innovative firms, is clearly affirmed by these results.*

According to the third hypothesis, employment in innovative firms located in suburban areas will grow faster than innovative firms located in urban areas. It was mentioned before that firms of all categories grow faster in Den Bosch (suburban) than in Amsterdam and Zaandam (urban). In order to test the third hypothesis, it will thus be necessary to compare the growth of employment in a specific sector with the average regional growth rates. This comparison will be made here using the classification of firms according to their orientation. From Table 7 it follows that firms in the information-oriented subsector in Den Bosch and Utrecht grow about three times as fast as the average for all subsectors in these cities. In Amsterdam and Zaandam these differences are considerably smaller. Information-oriented firms thus also appear to grow *retatively* in the suburban region of Den Bosch than in the urban region of Amsterdam. The average growth figure for employment in the information-oriented firms in Zaandam is flattered by the large negative value in the year 1986. However, the number of observations for this sector in Zaandam in this year is very small, while the number of observations is much higher in subsequent years. Therefore, it might well be that the real average annual growth of the information-oriented firms in Zaandam during the period 1985-92 is higher than the 4.5 per cent shown in Table 7.

Table 7

Annual Growth of Full-time Employment in the Information-Oriented Sector during the Period 1985-92

	Den Bosch	Utrecht	Amsterdam	Zaandam
1985		12.3	7.7	5.9*
1986	23.8	16.9	12.1	−19.6*
1987	12.1	12.0	5.6	9.1
1988	11.0	9.5	3.3	9.0
1989	8.3	10.9	6.4	13.4
1990	12.7	9.9	5.0	10.2
1991	8.0	7.8	1.2	6.2
1992	4.5	−1.3	0.3	2.3
(A) Total	11.4	9.7	5.2	4.5
(B) Total all sectors	3.8	3.0	2.1	2.0
(A)/(B) relative growth	3	3.2	2.5	2.2

*The number of firms in this Chamber in this sector in this year is very small.

These results clearly support *out third hypothesis, stating that information-oriented firms grow relatively faster in suburban regions than in urban regions*. Again, it should be noticed that in this study only a small number of areas has been taken into account.

V. AN EXPLANATORY MODEL FOR THE DEMAND FOR LABOUR

In the first part of this paper the regional and sectoral differences in the growth of employment have been described. In the second part of this paper attention will be paid to the regional and sectoral differences in enterpreneurial behaviour as a potentially explanatory factor being the difference in the growth in employment. In labour-demand theory[5] a change in the level of employment

[5]For more details on the type of labour demand model applied to our data, see Hamermesh (1989).

in a firm is considered as an adjustment to the optimal level of employment (E_t*) in the firm (see equation 1). This adjustment takes place with a certain lag, so that we arrive at the following specification:

$$E_t = \alpha E_{t-1} + (1-\alpha)\, E_t^* \qquad (1)$$

The optimal level of employment is in the first place determined by the sales in the actual year. Besides, it is important for enterpreneurs to anticipate future changes in the level of sales. In this way, under- or over-capacity—be it in the form of capital goods or in the form of employees—can be avoided. When making decisions about hiring or firing employees, enterpreneurs will take into account the expected development of sales in the near future. Therefore, the optimal level of employment is not only determined by the sales in the current year, but also by the expected growth of sales in the next year (see equation 2).

$$E_t^* = \beta_0 + \beta_1 Y_t + \beta_2 E\,[g Y_{t+1}] \qquad (2)$$

Substitution of equation (2) in equation (1), and transforming the variables in logarithmic form, leads to the following explanation of the employment in a certain year:

$$\ln (E_t) = \gamma_0 + \alpha \ln (E_{t-1}) + \gamma_1 \ln (Y_t) + \gamma_2 \ln (E\,[g Y_{t+1}]) \qquad (3)$$

The level of sales in the current year (Y_t) is not included in the ERBO-survey. However, with the help of two other questions in this survey, it is possible to determine the level of sales in the current year. These questions concern the level of sales in the previous year and growth of sales in the current year. Multiplication of these two variables results in the level of sales in the current year. By determining the level of sales in this way, it is possible to estimate two separate parameters for each of the two subvariables. In our model, both parameters should be identical (namely equal to γ_1). However, there are two reasons for estimating the two parameters separately. First, the variable Y_{t-1} has been grouped in distinct size classes in the ERBO-survey, and is thus observed less accurately. Second, it allows us to test wether the equality of both parameters indeed holds.

In our model, we have used the class average for the determination of the sales in the previous year. The expectation of the growth of the sales in the next year ($E\,[gY_{t+1}]$) is grouped into three classes in the ERBO-survey: decline of sales, rise of sales with more than two per cent, and little or no change in sales (between zero and two per cent). Therefore, dummy-variables (for decreasing

and significantly increasing sales) have been used for $E\ [gY_{t+1}]$ in the regression analysis.

The final equation, which is now to be estimated, has thus the following specification:

$$\ln (E_t) = \delta_0 + \alpha \ln (E_{t-1}) + \delta_1 \ln (Y_{t-1}) + \delta_2 \ln (1 + g Y_t)$$
$$+ \delta_3 (E\ [g Y_{t+1}] > 0.02 + \delta_4 (E\ [gY_{t+1}] < 0) \qquad (4)$$

Equation (4) is the basis for the linear regressions conducted in this study. For each year, from (1985 to 1992, the model is estimated separately.

The regression analysis is carried out in three variants. In the first, and principal, variant attention is paid to the *region-specific differences*, by estimating the parameters of interest per Chamber of Commerce separately. The sectoral component in this variant is expressed by means of dummy variables: to each of the distinguished categories of firms, a dummy variable is assigned. Besides, this model is estimated separately for the group of small firms and for the group of large firms.[6] The purpose of the second variant is to further elucidate the *sectoral differences* in the equation for the demand for labour. For this variant, the four Chambers of Commerce have been pooled, and the regressions have been carried out for a specific sectoral classification. In the third and final variant, combined *regional-sectoral differences* are considered. Given the large number of potential combinations (20 subsectors × 4 regions), for this variant only a specific category of firms is considered, viz. the dynamic group of small, information-oriented firms. The results are given in the next section.

VI. RESULTS OF THE EXPLANATORY LABOUR DEMAND MODEL

We will present in this section the three classes of estimations of our labour demand model.

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[6]The reason for splitting up small and large firms in our explanatory model is twofold. First, our exploratory analysis reveals that small firms show substantially higher growth rates than large firms. Second, our data consists of the entire population of large firms, while only a sample of small firms is included. In principle, our labour demand model can be adjusted for the endogenous stratification due to the difference in sampling, but since we are particularly interested in behaviourial differences of enterpreneurs in small and large firms, the estimations are carried out separately for both groups.

VI.1 *Region-Specific Estimates for Labour Demand Variables*

In the *first* variant, 31 regressions (8 years × 4 Chambers—Den Bosch 1985) have been carried out for each of the sectoral classifications. From this multitude of estimation results, we will first present the general picture of the parameters of the underlying labour market variables of the model (α, δ), before discussing the sectoral and regional differences.[7]

It appears that the employment level in the previous year (E_{t-1}) plays an important role. The value of the parameter for this variable ranges from 0.92 to 1.02. This indicates that the adjustment of the level of employment to the optimal level takes places only slowly.[8]

The level of employment in a firm is also determined by the sales in the current year, which in our model is split into the sales of the previous year and the growth of sales in the current year. The parameter of the sales in the previous year is surprisingly low: the maximum value is equal to 0.04. Besides, this variable is only significant in a limited number of cases (about one out of three). The growth of sales in the current year, on the other hand, is in practically all cases significant. The elasticity of the growth of sales in the current year varies (apart from a few exceptions) between 0.3 and 0.6.[9] In labour-demand theory the sales in the current year are considered to co-determine the optimal level of employment. However, from the analyses described above, it follows that especially the recent development of sales is relevant. This result also implies that the hypothesis, stating that both parameters are identical (which means that the level of sales in the previous year and the current growth of sales have an equal influence), can be rejected.

In addition to the level of sales in the current year, the expected change in the sales in the next year is relevant for the determination of the level of employment. An expected decrease of sales in the next year seems to be a reason to reduce the current employment for some enterpreneurs. The value of the parameter of the dummy variable for the decrease of sales ranges from –0.02

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[7]The complete report of estimates is, for the sake of space reduction, not presented in our paper, but is available on request.

[8]Note that the parameter α might be an overestimation when firms are not homogeneous within a sector (since, in that case, the firm-specific effect might not be fully absorbed by the sectoral dummies).

[9]This result for the individual firm bears a great resemblance to the value of approximately 0.5 for the ''incidental production-volume elasticity'' of the demand for labour (also denoted as the ''smoothing-factor'') in the study of Den Butter (1991) of the main determinants of the demand for labour in The Netherlands according to several macro-economic models.

to –0.06. However, this variable is only significant in a very few cases (about one out of six). An expected increase in sales in the next year leads to a significant adjustment of the actual employment in twice as many cases. The value of the parameter of this dummy variable varies from 0.02 to 0.04.

In short, it appears that the influence of the enterpreneurial expectations regarding the sales in the next year on the employment in the current year, is rather limited.[10] From this analysis it appears that the two most important determinants of the level of employment are the level of employment in the previous year and the growth in sales in the current year.

The values of the parameters of the labour market demand variables do not differ significantly between small firms and large firms. However, the variables for the sales in the previous year and the expected change in sales in the next year are significant in considerably more cases for small firms than for large firms. A statistical explanation for this is that the number of observations for the model for small firms is much higher than for the model for large firms. As far as the expectations of the sales in the next year are concerned, this result points at the more dynamic character of small firms: small firms may be more able to adjust to new situations.

Sectoral Differences

The sectoral differences in the labour-demand equation are in the first variant expressed by means of dummy variables (in each case, the reference variable represents the category ''other firms''). The parameters of these dummy variables are rarely significant in these regressions, while the values of the parameters of the different dummy variables fall in almost all cases between –0.1 and 0.1. Besides, it appears that the region-specific parameters for the labour-market variables are identical for different regional classifications. In the case of large firms in the different manufacturing sectors, the parameters of the dummies have virtually only negative values. However, in case of the information-oriented sector, the dummy variables are more frequently significant. In line with the results of the above presented descriptive analysis, the estimates for firms specialized in computer services are striking.

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[10]It should be mentioned here that previous research based on the ERBO-data (for the years from 1986-89) revealed the enterpreneurs tend to systematically underestimate the expected change in sales. We therefore note that enterpreneurs show a risk-avert behaviour, when reporting the expected changes in sales (see also Nijkamp *et al.*, 1992 and Van der Ende and Nijkamp, 1993).

Regional Differences

The regional differences for the two dominant variables, namely the employment in the previous year and the growth of the sales in the current year, are presented in Figures 1 and 2[11]. In these figures, the development of these two variables are given for each Chamber of Commerce during the period 1985-92. Also a distinction has been made between small firms and large firms.

The values for the firms in Zaandam show strong fluctuations, probably due to the small number of firms in this Chamber of Commerce involved. As far as the small firms are concerned, there is no area that shows consistently higher values than the other areas for one of the parameters during the whole period. In Amsterdam, the elasticity of employment in the previous year is relatively low during the years 1985-87. However, during the years from 1990 to 1992, for small firms in Amsterdam this elasticity is relatively high compared to the other three cities.

In the case of firms with fifty of more employees, the regional differences are more pronounced. The elasticity of employment in the previous year in Amsterdam is higher than in Utrecht and Den Bosch except for the year 1992. In large firms in Amsterdam, the adjustment of employment to the optimal level thus appears to be rather slow, compared to Utrecht and Den Bosch, especially during the first four years.

The elasticity of the growth of sales in the current year for large firms in Den Bosch is relatively low, especially until 1989.

Figures 1 and 2 do not reveal any significant cyclical patterns in the values of the elasticities. For small firms it appears that in Amsterdam, Utrecht and Den Bosch the elasticity of the employment in the previous year shows a decreasing trend during the whole period. This suggests that small firms during this period have become more flexible in their demand for labour. At the end of the period, this elasticity is considerably lower for small firms than for large firms. A slightly decreasing trend can be noticed for the elasticity of the growth of sales in the current year for large firms. This may be an indication that these firms are behaving a little more conservative at the end of the period than in the first few years.

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[11]For the sectoral dummies, the subdivision according to orientation of the firm is used.

VI.2 *Sector-Specific Estimates of Labour Demand Variables*

In the *second* variant of the explanatory analysis, further attention is paid to the potential sectoral differences in the equation for the demand for labour. In this variant, the firms are subdivided according to their orientation. This classification includes all firms, and in the analyses described above revealed some interesting differences between the different subsectors. In order to present the sectoral pattern as clearly as possible, for this variant the four Chambers of Commerce have been pooled. In this paper we will only consider the group of small firms, because this group showed by far the highest frequency of significant sectoral dummies in the first variant (this group also has a considerably higher number of observations).

In Figures 3 and 4 the development of the two elasticities, that were also discussed in the previous variant, are presented for the years 1985-92. For the sake of a concise presentation, the values of the elasticities for the three subsectors (material-, persons- and information-oriented) are combined in one figure.

The elasticity of the level of employment in the previous year for information-oriented firms in almost all years appears to lower (0.90-0.95) than for firms with another orientation (0.93-0.96). This corresponds to the image of the information-oriented sector as a dynamic sector.

The elasticity of the growth of sales in the current year shows less clear sectoral differences for the classification according orientation of the firm. In general, the value of this elasticity is somewhat higher for material-oriented firms (0.32-0.47) than for person-oriented firms (0.20-0.43). In the mid-eighties (1985-86), the elasticity of the growth of sales in the current year for information-oriented firms was lower than for the other two categories. However, during the period 1985-92 there has been a firm increase in this elasticity for the information-oriented sector (0.16-0.54). In the early nineties the elasticity of the growth of sales in the current year for this sector was considerably higher than for the other two sectors. This result again confirms the dynamic character of small firms in the information-oriented sector.

VI.3 *Region-sector Specific Estimates of Labour Demand Variables*

In the first two variants, the regional and sectoral differences in the parameters of the underlying labour-market variables have been studied separately. In the *third* variant, attention will be focussed on the combined region-sector specific differences in the parameters of the labour-demand model. In this paper, the

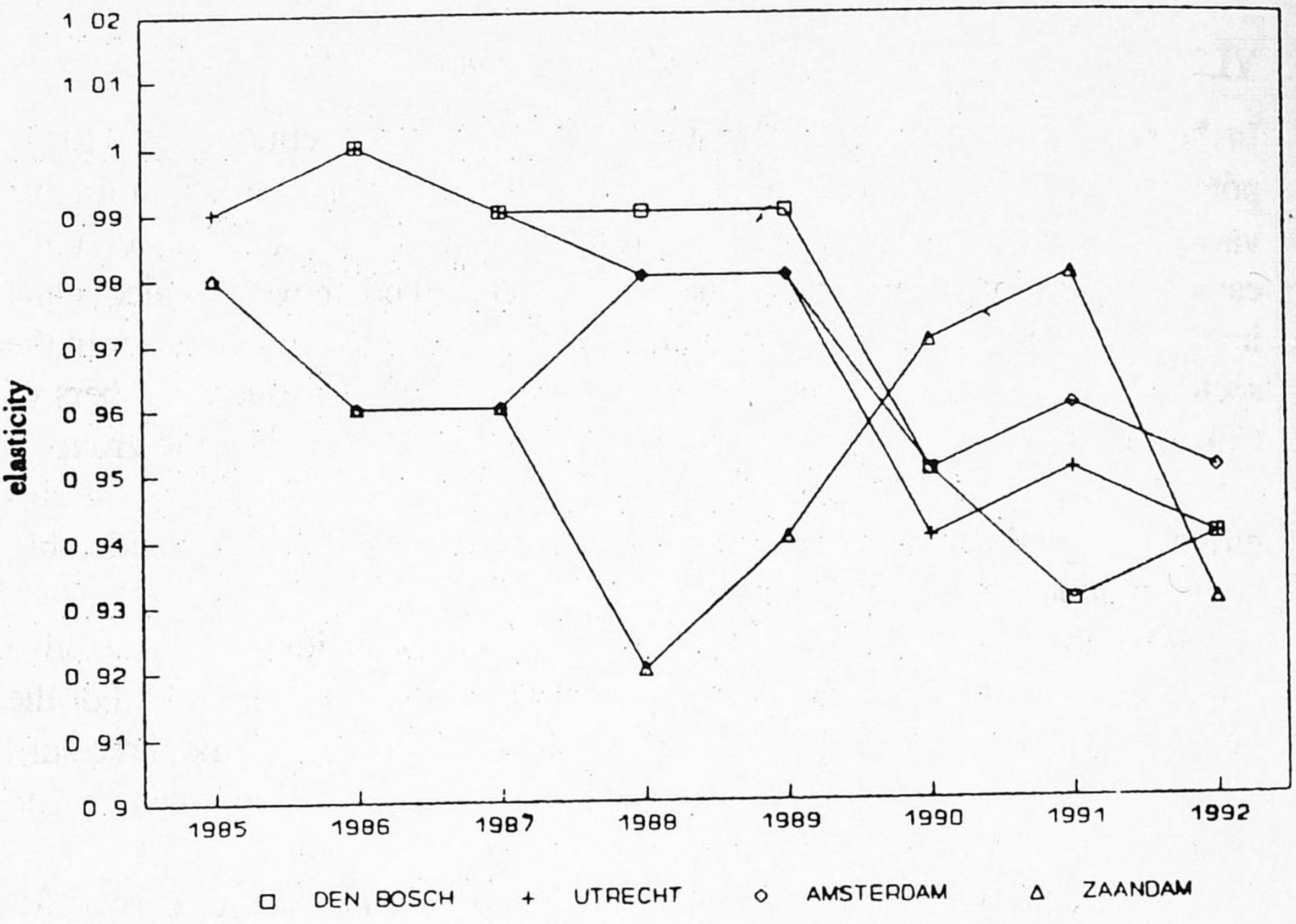

Fig. 1a Elasticity of the Employment in the Previous Year, for Small Firms.

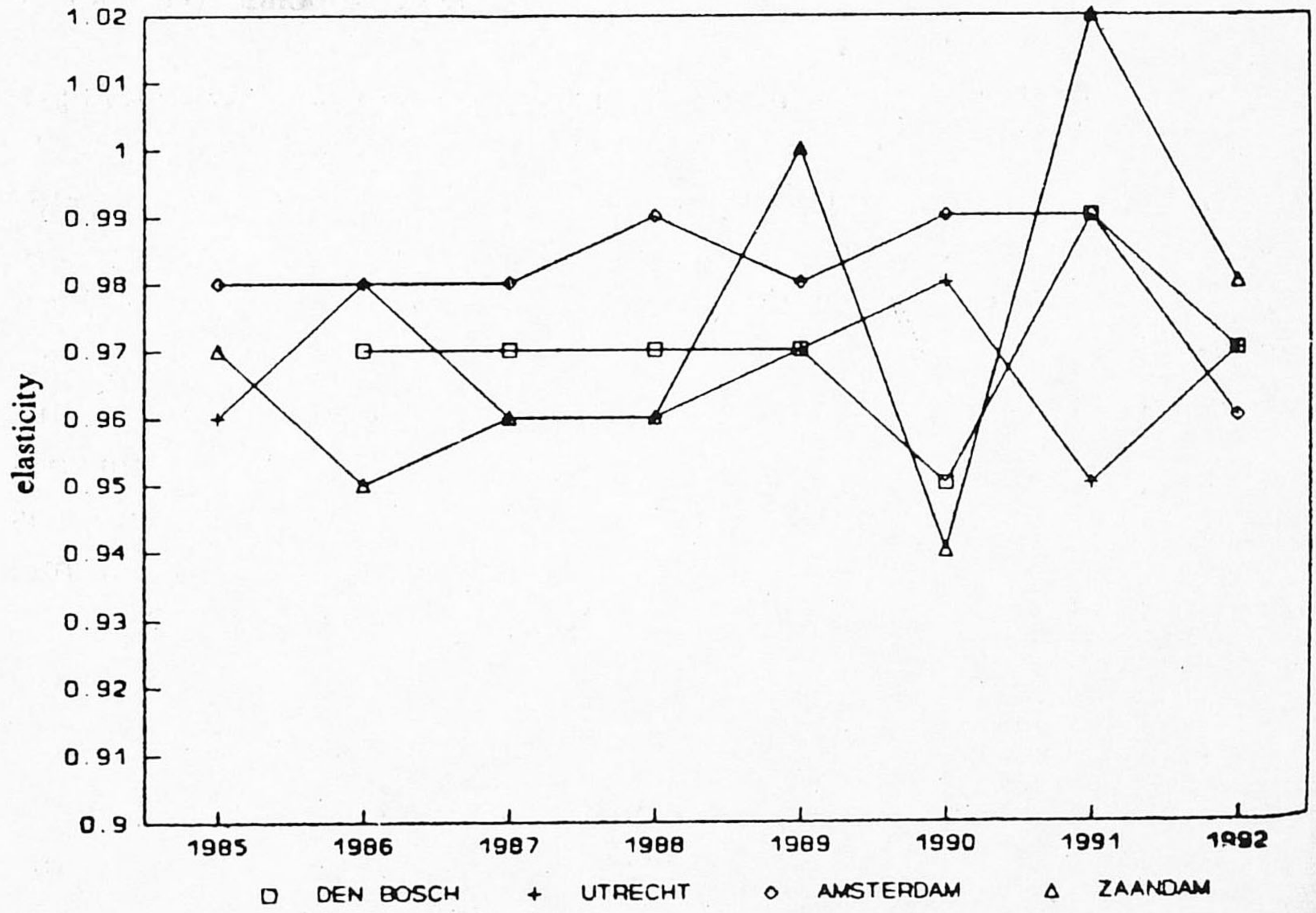

Fig. 1b. Elasticity of the Employment in the Previous Year, for Large Firms.

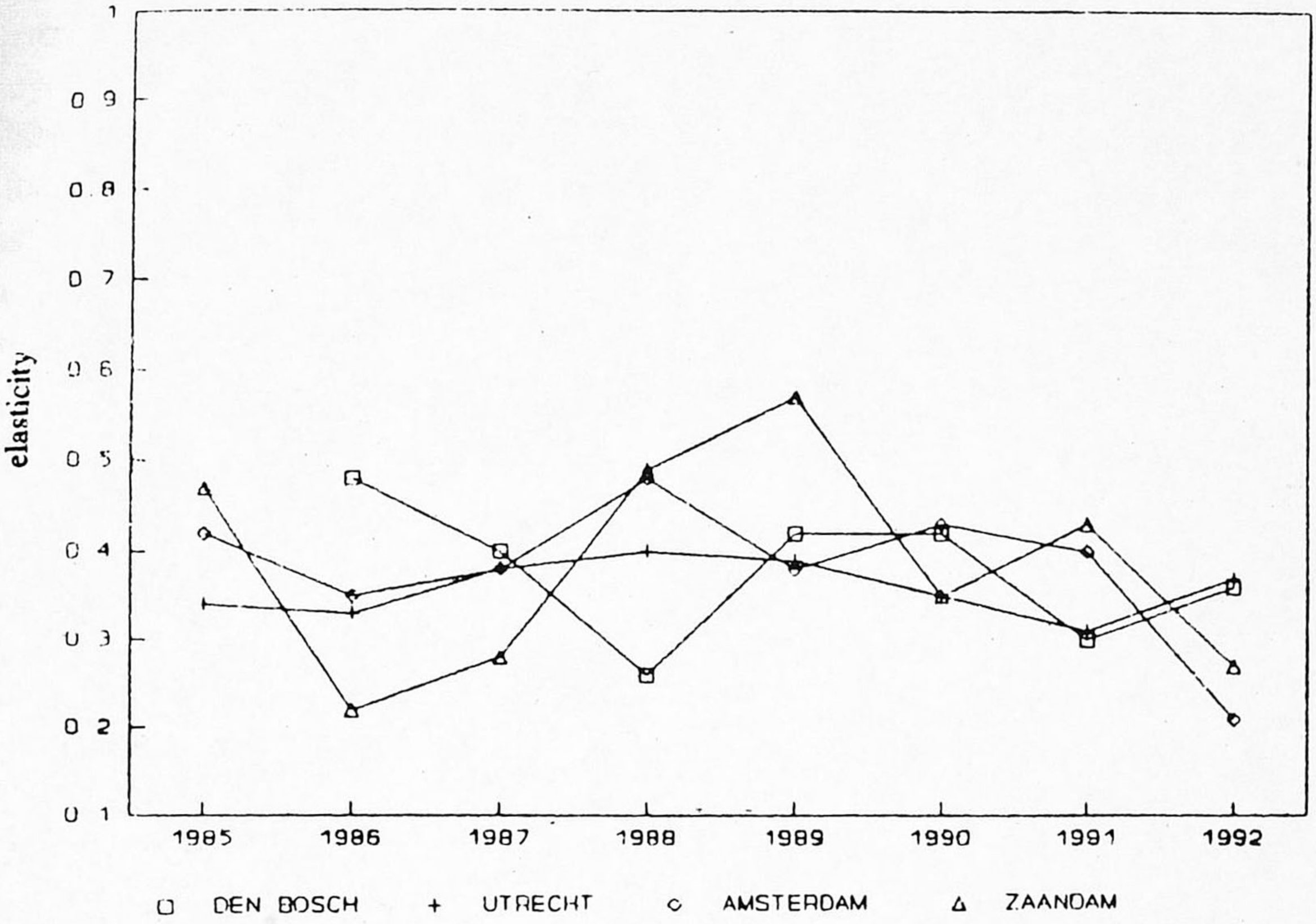

Fig. 2a. Elasticity of the Growth of Sales in the Current Year, for Small Firms.

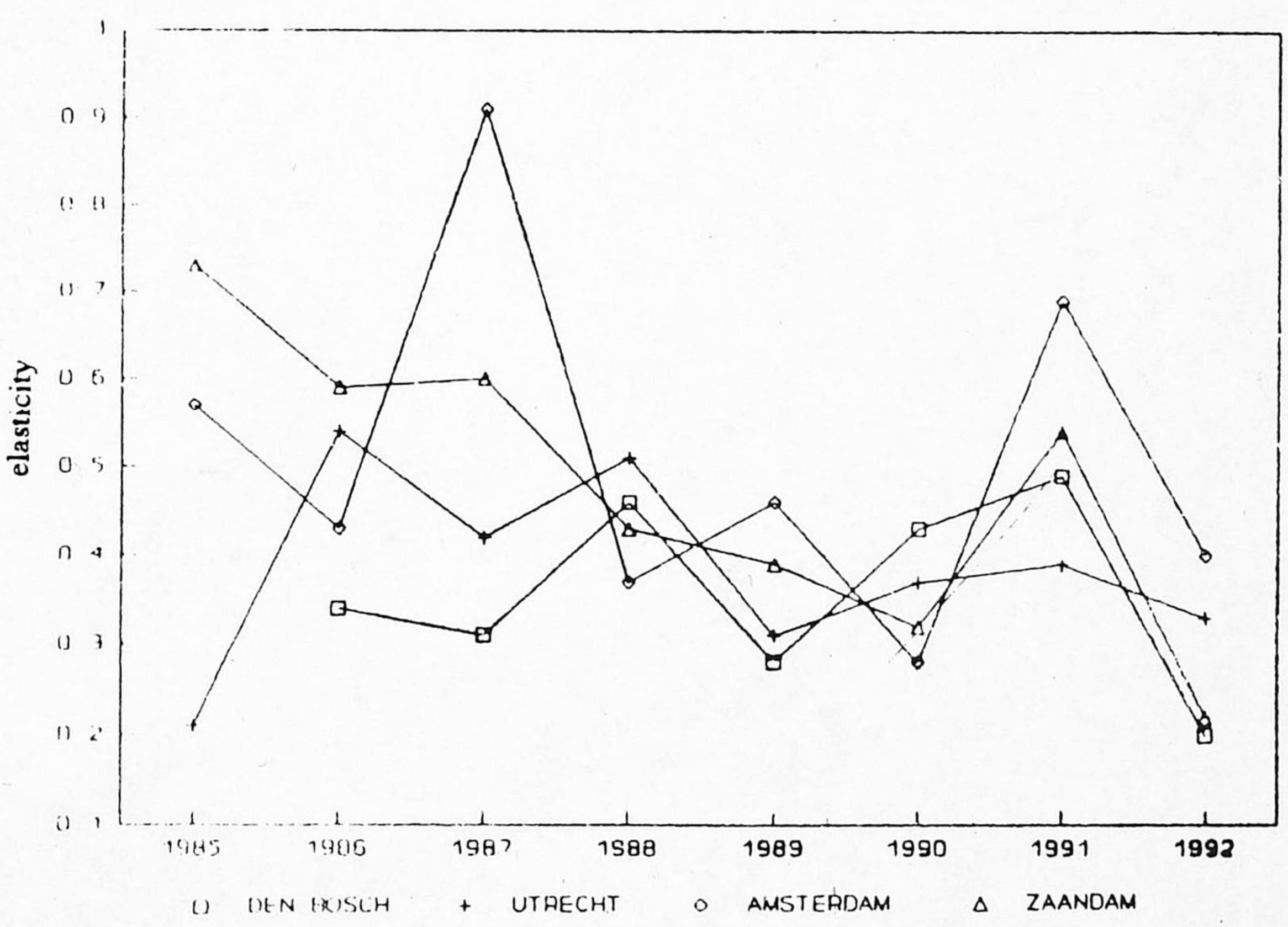

Fig. 2b. Elasticity of the Growth of Sales in the Current Year, for Large Firms.

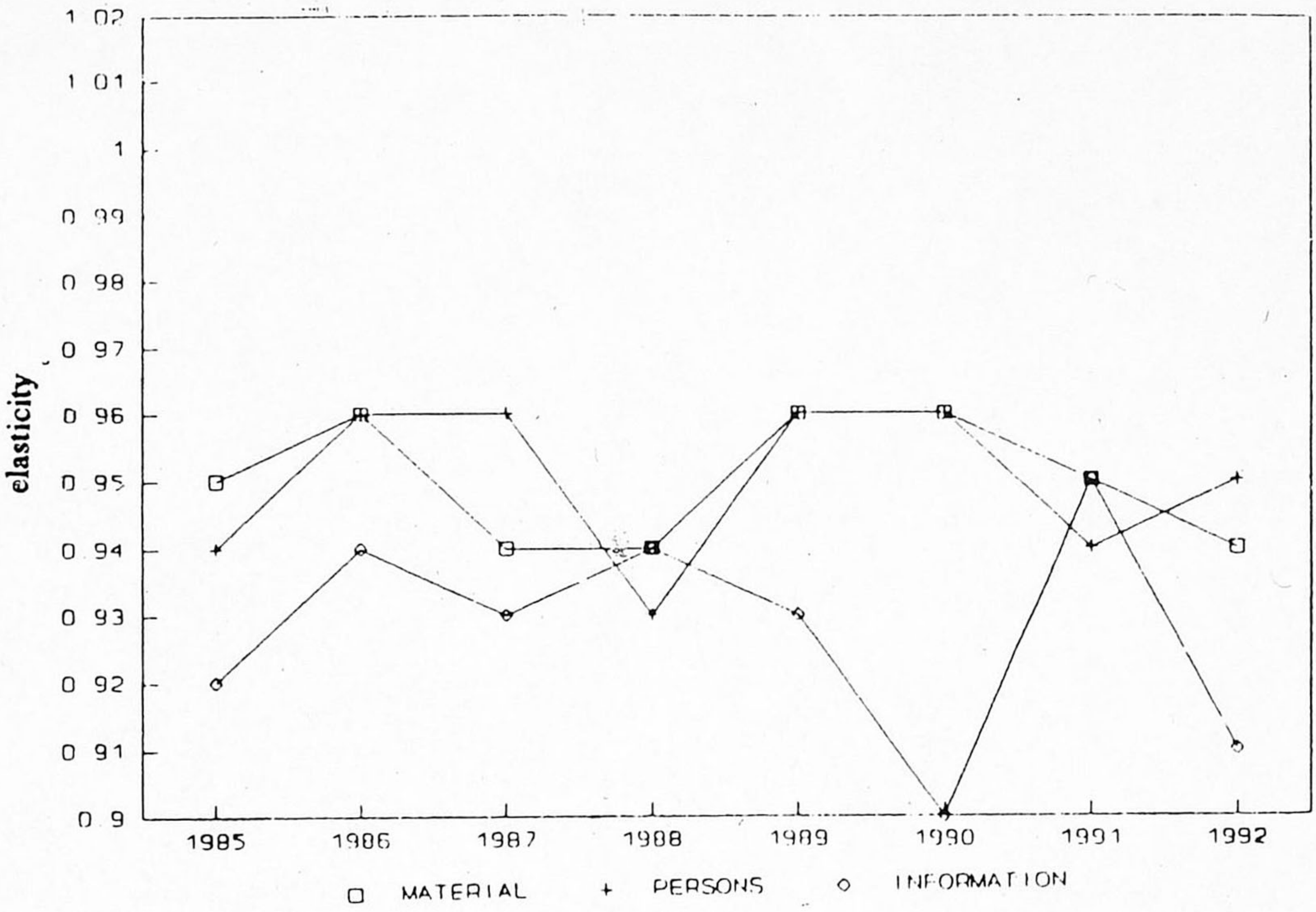

Fig. 3. Elasticity of Employment in the Previous Year, for Small Firms, according to Orientation of the Firm.

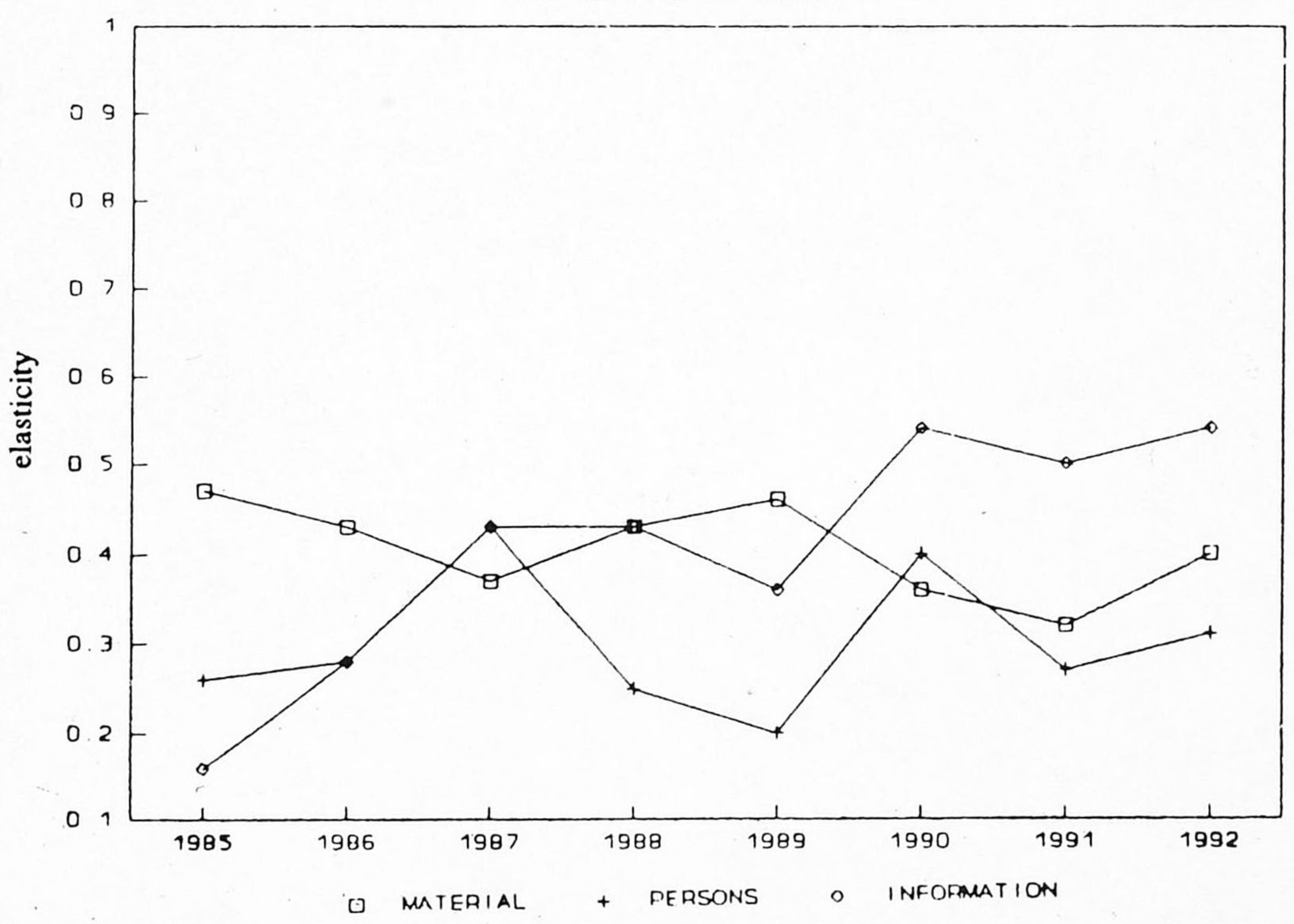

Fig. 4. Elasticity of the Growth of Sales in the Current Year, for Small Firms, according to Orientation of the Firm.

group of the small information-oriented firms—as a typical example of a dynamic sector—will be discussed. In Table 8 the estimated parameters for all labour-demand variables that have been included in the model, are presented for each year. In this final variant only three areas, namely Amsterdam, Utrecht and Den Bosch, are considered. The number of observations of small information-oriented firms in Zaandam was too small to possibly lead to useful results. As can be seen in Table 8, within the information-oriented sector there are hardly any persistent regio-sector specific differences for the values of the parameters of the labour-demand equation applied in this study. The values for the different regions appear to fluctuate strongly during the period considered. It is also noteworthy that no cyclical patterns can be observed. Roughly the results for the small information-oriented firms are in line with the overall picture: employment in the previous year and the growth of sales in the current year are the most important variables for the determination of the demand for labour. An interesting difference is that the elasticity of sales in the previous year is larger and more frequently significant than in the first variant. Also a striking regional distinction can be noticed here. Small information-oriented firms in Amsterdam react less strongly to the level of sales in the previous year, when deciding the level of employment in the current year, than firms in Utrecht and Den Bosch. The elasticity of sales in the previous year is generally lower in Amsterdam, and besides less frequently significant. This is an indication that small information-oriented firms in suburban areas like Utrecht and Den Bosch transform to a larger extent realized growth of sales in the past into employment, than firms in a central area like Amsterdam.

VII. POLICY IMPLICATIONS

The variations in the realized growth figures for employment across regions and sectors, have shown that (small) firms in suburban areas grow faster than (small) firms in urban areas, and that innovative firms perform better than less innovative firms. Besides, it appears that innovative firms in suburban areas perform better than innovative firms in urban areas.[12] This conclusion is based on the relative performance of information-oriented firms in urban and sub-urban areas and seems to be in correspondance with the idea of "creative

[12]This conclusion refers to the individual firm; the extent to which the increase of employment in innovative firms has positive or negative consequences (complementarity or substitution) for the level of employment in other firms, can—on the basis of the results obtained in this study—not conclusively be assessed.

Table 8

Elasticities of the Demand for Small Information-oriented Firms

Variable→	Employment in the previous year (E_{t-1})						Sales in the previous year (Y_{t-1})						Growth of sales in the current year (ΔY_t)					
region→ year↓	Den Bosch		Utrecht		Amsterdam		Den Bosch		Utrecht		Amsterdam		Den Bosch		Utrecht		Amsterdam	
1985	—		.89*	.04	.96*	.05	—		.09*	.03	.05	.03	—		.16*	.08	.12	.21
1986	.93*	.04	1.02*	.04	.87*	.05	.05*	.02	.01	.03	.08*	.03	.36*	.08	.04	.09	.35*	.12
1987	.88*	.04	.92*	.03	.96*	.03	.07*	.03	.06*	.02	.02	.02	.27*	.09	.61*	.09	.45*	.09
1988	.97*	.03	.93*	.03	.97*	.02	.03	.02	.04*	.02	.02	.02	.24	.13	.43*	.07	.40*	.07
1989	1.01*	.04	.89*	.03	.95*	.03	.00	.03	.10*	.02	.01	.02	.64*	.16	.36*	.06	.15*	.08
1990	.90*	.03	.89*	.03	.86*	.03	.09*	.03	.08*	.02	.07*	.02	.48*	.09	.57*	.07	.58*	.08
1991	.95*	.02	.90*	.03	.95*	.03	.04*	.02	.06*	.02	.01	.02	.43*	.06	.37*	.06	.67*	.08
1992	.86*	.04	.91*	.03	.94*	.02	.09*	.03	.07*	.02	.03	.01	.66*	.08	.67*	.09	.23*	.07

For each Chamber of Commerce and for each year the values of the elasticities of the five variables are given. The parameters which are significant are marked with an asterisk *. The second entry in each cell (at the right hand side) represents the standard deviation of this elasticity. The last part of this table shows the number of observations for each region and each year, as well as the R^2 of the corresponding regression.

Table 8 (Contd.)

Variable→	Expected increase in sales in the next year (dummie $EY_{t-1}\uparrow$)						Expected decrease in sales in the next year (dummie $EY_{t-1}\downarrow$)						Number of observations and R^2					
region→ year↓	Den Bosch		Utrecht		Amsterdam		Den Bosch		Utrecht		Amsterdam		Den Bosch		Utrecht		Amsterdam	
1985	—		,06	,05	,00	,07	—		-,11	,07	-,07	,09	—		79	.97	62	.96
1986	,09	,05	,07	,05	-,06	,06	-,15	,10	-,08	,09	-,08	,10	95	.97	82	.98	74	.97
1987	,14*	,06	-,02	,04	,11*	,04	-,15	,10	-,07	,07	-,20*	,08	107	.95	185	.96	150	.96
1988	,04	,04	,06	,04	,04	,03	-,05	,07	-.07	,08	-,02	,05	113	.97	206	.95	150	.98
1989	,08	,05	,05	,03	,04	,04	-.08	,10	,03	,07	,01	,07	109	.95	183	.96	133	.97
1990	,01	,04	,00	,04	,05	,04	-,14	,08	,03	,09	,04	,10	119	.96	192	.94	161	.95
1991	,02	,03	,06	,04	,04	,05	-,15*	,06	-,10	,07	-,11	,06	185	.96	182	.95	182	.93
1992	-,01	,05	-,02	,04	,05	,03	-,04	,09	-.19*	,06	-,09*	,05	203	.92	175	.95	169	.97

diffusion'' of innovations within a technology path (namely, information technology). These findings support in the first place the idea that innovative activities lead to an expansion of the number of jobs. Second, it can be observed that the process of employment growth thrives best in a suburban setting. This is probably—according to the ''Urban Field'' theory—the result of the better accessibility and liveability in suburban areas. It is thus plausible that local governments can stimulate the process of job creation by creating better conditions for innovation-oriented firms. In this context one may think of the stimulation of (regional) co-operation in R & D between centers of knowledge (technical institutes) and companies, preferably oriented at small or medium-size firms. Besides, local governments may encourage the positive development of innovative firms by creating favourable incubation conditions, like for example commercial areas or properties, integrated policies for housing and the establishment of firms, and the construction of supporting transportation infrastructure. When implementing such a policy, the government should of course not neglect other objectives, like reduction of spatial mobility and improvement of environmental quality.

The analysis of the factors responsible for the observed regional-sectoral differences in the demand for labour, makes clear that the influence of the expected change of sales is rather limited. Only in case of small firms we see a modest expansion of the number of (full-time) employees as a result of an expected increase in sales in the next year. Besides the level of employment in the previous year, especially the growth of sales in the current year appears to be an important determinant of the demand for labour. This holds above all for the dynamic group of small information-oriented firms. Apparently, even dynamic firms operate in a conservative way on the labour market; new workers are hired only if the increase in sales becomes manifest.

Finally, we may conclude by stating that the identification of firms which are strongly expanding their number of employees, according to type and location, is also useful for the development of a coherent labour market, technology and physical planning policy, aiming at the stimulation of innovative commercial activities on suitable locations, in order to induce a substantial growth of the number of jobs in the coming years.

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